

WHAT IS CLAIMED IS

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1. A handover control method that switches a radio base station serving as a communicating counterpart of a mobile station comprising:

10 detecting whether any of mobile stations communicating with the radio base station become incapable of communicating while a predetermined minimum bandwidth secured; and

15 switching the communicating counterpart of the mobile station that communicates with said radio base station from said radio base station to another radio base station.

20 2. A handover control method that switches the radio base station serving as the communicating counterpart of the mobile station, comprising:

detecting whether any of mobile stations communicating with the radio base station become incapable of communicating while the predetermined minimum bandwidth secured; and

25 switching the communicating counterpart of the mobile station that communicates with said radio base station from said radio base station to a plurality of other radio base stations.

30 3. The handover control method as claimed in claim 1 or 2, wherein

35 a radio base station whose electric field intensity was the strongest and a mobile station that measured it are selected as the mobile station as the object of the handover and the radio base station serving as the communicating counterpart thereof, excepting a set of the mobile station and

the radio base station under current communication,  
based on electric field intensity information about  
the radio base stations obtained from each mobile  
station.

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4. The handover control method as claimed  
in claim 1 or 2, wherein

a mobile station to which allocation of  
radio resources is the nearest to the minimum  
10 bandwidth and a radio base station which has the  
most radio resources available are selected as the  
mobile station and the radio base station for the  
handover object.

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5. The handover control method as claimed  
in claim 1 or 2, wherein

a mobile station that requires the radio  
resources in the highest value of the minimum  
bandwidth and a radio base station in which the  
20 radio resources are available the most are selected  
as the mobile station and the radio base station for  
the handover object.

6. The handover control methods as claimed  
25 in any one of claims 1 through 5, wherein

the detection of an inability to  
communicate while the predetermined minimum  
bandwidth secured at any of mobile stations that  
communicate with the radio base station is realized  
30 by measuring an electric field intensity, a bit  
error rate, a frame error rate, a packet error rate,  
a packet discarding rate, or any combination thereof  
and basing on the measuring result thereof.

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7. The handover control methods as claimed  
in any one of claims 1 through 6, wherein

said mobile station selects a radio base

station that serves as the communicating counterpart after said switching.

8. The handover control methods as claimed  
5 in any one of claims 1 through 6, wherein  
the radio base station which serves as the  
communicating counterpart after said switching is  
selected by a node other than said mobile station;  
information indicative of the selected  
10 radio base station is reported to said mobile  
station from said node; and  
the radio base station which serves as the  
communicating counterpart of said mobile station is  
switched to the reported radio base station.

15  
9. The handover control methods as claimed  
in any one of claims 1 through 8, comprising  
detecting when a communication securing a  
predetermined minimum bandwidth becomes impossible  
20 at any of mobile stations that are communicating  
with a radio base station in a first radio  
communication system that employs a first  
communication protocol; and  
transferring information relative to radio  
25 resources of said mobile station from said first  
radio communication system to said second radio  
communication system via a wired section upon  
converting the protocol,  
when switching the communicating  
30 counterpart of the mobile station that communicates  
with said radio base station to the second radio  
base station that employs the second communication  
protocol when said detection was made.

35  
10. A handover control method which  
switches a radio base station which serves as the  
communicating counterpart of a mobile station,

comprising:

deciding as to whether communication of a radio base station will be in a traffic congestion condition;

5           selecting a combination of a mobile station that communicates with said radio base station and one or more radio base stations with which said mobile station can communicate according to a predetermined standard when the decision is  
10       made that the communication of the radio base station will become congested; and

             switching the communicating counterpart of the mobile station in the selected combination to one or more radio base stations in the combination.  
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             11. The handover control method as claimed in claim 10, wherein  
             the predetermined standard for selecting a combination of said mobile station and a radio base  
20       station is defined based upon an available amount of radio resources of a radio base station or an amount of the radio resources required.

             12. The handover control methods as  
25       claimed in claim 10 or 11, wherein  
             the predetermined standard for selecting the combination of said mobile station and a radio base station is defined based upon receiving electric field intensity of the communication  
30       between the mobile station and the radio base station.

             13. The handover control methods as claimed in any one of claims 10 through 12, wherein  
35       the predetermined standard for selecting the combination of said mobile station and a radio base station is defined based upon the ratio of the

amount of radio resources permitted to the mobile station to the amount of radio resources currently used in fact.

5           14. The handover control methods claimed  
in any one of claims 10 through 13, wherein  
the predetermined standard for selecting  
the combination of said mobile station and a radio  
base station is defined based upon the number of the  
10 radio base stations which should perform  
simultaneous communications after switching the  
communicating counterpart.

15           15. The handover control methods as  
claimed in any one of claims 10 through 14, wherein  
the predetermined standard for selecting  
the combination of said mobile station and a radio  
base station is defined based upon whether the radio  
base station which is performing the current  
20 communication is included in the radio base stations  
with which the mobile station is to communicate  
after switching the communicating counterpart.

25           16. The handover control method as claimed  
in any one of claims 10 through 15, wherein  
a priority about the appropriateness of  
mutual communication is given to combinations of  
each mobile station that communicates with said  
radio base station and said radio base station and  
30 one or more of radio base stations adjacent to the  
radio base station in accordance with said  
predetermined standard; and  
a selection is made in favor of the  
combination of a mobile station and a radio base  
35 station with a higher priority.

17. The handover control methods as

claimed in any one of claims 10 through 16, wherein  
the process for selecting a combination of  
any of mobile stations that communicate with said  
radio base station and one or more radio base  
stations that can communicate with said mobile  
station is performed by a node that is connected to  
each radio base station via a wired section.

18. The handover control methods as  
claimed in any one of claims 10 through 16, wherein  
a mobile station that communicates with  
said radio base station performs the process for  
selecting a combination of said mobile station and  
one or more radio base stations with which said  
mobile station can communicate according to said  
predetermined standard.

19. The handover control method as claimed  
in claim 18, wherein  
said mobile station which communicates  
with said radio base station determines whether said  
radio base station is in a traffic congestion  
condition.

20. The handover control methods as  
claimed in any one of claims 1 through 19, wherein  
the communication conditions between the  
mobile station and one or more radio base stations  
are supervised after switching the communicating  
counterpart of said mobile station to said one or  
more radio base stations; and  
a process is performed such that the  
communicating counterpart of said mobile station may  
be switched again when the supervised communication  
condition turned into a condition poorer than the  
predetermined standard condition.

21. The handover control method as claimed  
in claim 20, wherein

an error rate in communication between a  
mobile station and one or more radio base stations  
5 is supervised as said communication condition.

22. A handover system that switches radio  
base stations as the communicating counterpart of a  
mobile station, comprising:

10 detection means for detecting an inability  
of any of mobile stations that are communicating  
with a radio base station to communicate while a  
predetermined minimum bandwidth condition secured;  
and

15 switching control means for switching the  
communicating counterpart of the mobile station  
communicating with said radio base station from said  
radio base station to another base station when said  
detection means detected that any mobile station is  
20 unable to communicate while the predetermined  
minimum bandwidth condition secured.

23. A handover control system that  
switches radio base stations as the communicating  
25 counterpart of a mobile station, comprising:

detection means for detecting an inability  
of any of mobile stations that are communicating  
with a radio base station to communicate while a  
predetermined minimum bandwidth condition secured;  
30 and

switching control means for switching the  
communicating counterpart of the mobile station  
communicating with said radio base station from said  
radio base station to a plurality of other base  
35 stations when said detection means detected that any  
mobile station is unable to communicate while the  
predetermined minimum bandwidth condition secured.

24. The handover control system as claimed  
in claim 22 or 23, wherein

5       said switching control means comprises  
selection means for selecting a radio base station  
whose electric field intensity is the strongest and  
the mobile station that measured it as the mobile  
station and the radio base station serving as the  
10       communicating counterpart for the handover, based on  
the electric field intensity information relative to  
radio base stations obtained from each mobile  
station, excepting the combination of the mobile  
station and the radio base station in current  
communication.

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25. The handover control system as claimed  
in claim 22 or 23, wherein

      said switching control means comprises  
selection means for selecting a combination of a  
20       mobile station that is assigned an amount of radio  
resources the closest to the minimum bandwidth and a  
radio base station where the radio resources are  
available the most as the mobile station and the  
radio base station for the handover.

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26. The handover control system as claimed  
in claim 22 or 23, wherein

      said switching control means comprises  
selection means for selecting a combination of a  
30       mobile station that requires a large amount of the  
radio resource with the highest value of the minimum  
bandwidth and a radio base station where the radio  
resources are available the most as the mobile  
station and the radio base station for the handover.

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27. The handover control system as claimed  
in any one of claims 22 through 26, wherein



said detection means comprises measurement means for measuring an electric field intensity, bit error rate, a frame error rate or a packet discarding rate, or any combinations thereof, and  
5 the detection of the inability to communicate of any mobile stations that are communicating with the radio base station while the predetermined minimum bandwidth secured, based on measurement results by said measurement means.

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28. The handover control system as claimed in any one of claims 22 through 27, wherein

15 said mobile station selects the radio base station serving as the communicating counterpart after said switching.

29. The handover control system as claimed in any one of claims 22 through 27, wherein,

20 the radio base station which serves as the communicating counterpart after said switching is selected by a node other than said mobile station;

the information on the selected radio base station is reported to said mobile station from said node; and

25 the switching is made to the reported radio base station as the base station to serve as the communicating counterpart of said mobile station.

30 30. The handover control system as claimed in any one of claims 22 through 29, wherein

35 said detection means detects that any mobile station among mobile stations under communication with a radio base station of the first radio communication system that employs the first communication protocol becomes unable to communicate in the condition that the predetermined minimum bandwidth is secured,

said handover control system comprising means that transfers information about radio resources of said mobile station from said first radio communication system to said second radio communication system upon protocol conversion when the communicating counterpart of the mobile station that communicates with said radio base station is switched to a radio base station in the second radio communication system that employs the second communication protocol by said switching control means when said detection means makes said detection.

31. In handover control systems that switch a radio base station which serves as communicating counterpart of a mobile station, comprising:

traffic congestion checking means for deciding whether communication of a radio base station will be in a traffic congestion condition;

20                    selection means for selecting a  
combination of any mobile station that is  
communicating with said radio base station and one  
of a plurality of radio stations with which  
communication is possible with said mobile station  
25 in accordance with a predetermined standard when  
said traffic congestion checking means determines  
that the radio base station will be in a traffic  
congestion condition; and

switching control means for switching the  
30 communicating counterpart of the mobile station in  
the selected combination to one or more radio base  
stations in the combination.

32. The handover control system as claimed  
35 in claim 31, wherein

the predetermined standard for selecting a combination of said mobile station and radio base

station is defined based on the amount of available radio resources in the radio base station, or the amount of radio resources required.

5           33. The handover control system as claimed in claim 31 or 32, wherein

          the predetermined standard for selecting a combination of said mobile station and a radio base station is defined based upon the receiving electric  
10 field intensity in communication between mobile stations and radio base stations.

          34. The handover control system as claimed in claim 31 or 33, wherein

15           the predetermined standard for selecting a combination of said mobile station and a radio base station is defined based upon the ratio of the amount of radio resources permitted to the mobile station to the amount of radio resources currently  
20 used in fact.

          35. The handover control system as claimed in any one of claims 31 through 34, wherein

          the predetermined standard for selecting a  
25 combination of said mobile station and a radio base station is defined based upon the number of the radio base stations which should perform simultaneous communication after switching the communicating counterpart.

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          36. The handover control system as claimed in any one of claims 31 through 35, wherein

          the predetermined standard for selecting a combination of said mobile station and a radio base  
35 station is defined based upon whether the radio base station which is performing the current communication is included.

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37. The handover control system as claimed  
in any one of claims 31 through 36, wherein,

- 5       said selection means gives the priority  
about the appropriateness of mutual communication to  
combinations of each mobile station that  
communicates with said radio base station and said  
radio base station and one or more adjacent radio  
base stations; and
- 10       a combination of a mobile station and a  
radio base station which is given with the highest  
priority is selected.

38. The handover control system as claimed  
15   in any one of claims 31 through 37, wherein  
      said selection means is provided in a node  
connected to each radio base station via a wired  
section.

- 20       39. The handover control system as claimed  
in any one of claims 31 through 37, wherein  
      a mobile station which communicates with  
said radio base station selects a combination of  
said mobile station and one or more radio base  
25   stations with which communication is possible in  
accordance with said predetermined standard.

40. The handover control system as claimed  
in claim 39, wherein
- 30       said mobile station that communicates with  
said radio base station comprises said traffic  
congestion detection means.

41. The handover control system as claimed  
35   in any one of claims 22 through 40, comprising:  
      communication condition supervision means  
for supervising the communication condition between

the mobile station and one or more radio base stations after switching the communicating counterpart of said mobile station to said one or more radio base stations;

5           condition decision means for deciding whether the communication condition supervised by said communication condition supervision means will be in a condition poorer than the predetermined standard condition; and

10           re-switching control means for performing process for switching the communicating counterpart of said mobile station again when said condition decision means determines that the communication condition as supervised is in a condition poorer  
15           than the predetermined standard condition.

42. The handover control system as claimed in claim 41, wherein

20           said communication condition supervising means comprises error rate detection means for supervising an error rate in communication between a mobile station and one or more radio base stations as said communication condition.